The power sector goes digital - Next generation data management for energy consumers

A EURELECTRIC report

May 2016

EURELECTRIC is the voice of the electricity industry in Europe.

We speak for more than 3,500 companies in power generation, distribution, and supply.

We Stand For:

***Carbon-neutral electricity** by 2050*

We have committed to making Europe's electricity cleaner. To deliver, we need to make use of **all low-carbon technologies**: more renewables, but also clean coal and gas, and nuclear. Efficient electric technologies in **transport and buildings**, combined with the development of smart grids and a major push in **energy efficiency** play a key role in reducing fossil fuel consumption and making our electricity more sustainable.

***Competitive** electricity for our customers*

We support well-functioning, distortion-free **energy and carbon markets as** the best way to produce electricity and reduce emissions cost-efficiently. Integrated EU-wide electricity and gas markets are also crucial to offer our customers the **full benefits of liberalisation**: they ensure the best use of generation resources, improve **security of supply**, allow full EU-wide competition, and increase **customer choice**.

***Continent-wide** electricity through a coherent European approach*

Europe's energy and climate challenges can only be solved by **European – or even global – policies,** not incoherent national measures. Such policies should complement, not contradict each other: coherent and integrated approaches reduce costs. This will encourage **effective investment to** ensure a sustainable and reliable electricity supply for Europe's businesses and consumers.

EURELECTRIC. Electricity for Europe.

Dépôt légal: D/2016/12.105/22

The power sector goes digital - Next generation data management for energy consumers

A EURELECTRIC report *May 2016*

KEY MESSAGES

- Advances in technologies, telecommunications and data analytics – digitalisation – are progressively changing the consumer environment, and together with it, they provide energy players[1] with new opportunities. Digitalisation also poses significant challenges in terms of DSO and retail supply regulation and policy-making.

- Discussing data management requires a proper understanding of the different kinds of data that exist and how they are covered by regulation. EURELECTRIC proposes to distinguish between (smart) meter data, (smart) grid data and (smart) market data and to divide data uses into regulated obligations and commercial services.

- Home devices can be connected to one another, generate and exchange massive sets of data - yielding new insights into consumer habits and preferences. Consumers can have more control over their energy usage and become active players in the energy market. Data privacy and security must always be ensured by all market players[2].

- Full sector digitalisation allows suppliers to have a deeper and improved relationship with their customers. Data will be more granular and new tools will become available to better tailor communication, increase transparency and, most importantly, develop more personalised offers and services. For consumers to fully benefit from innovation, it is crucial that the regulatory framework is more flexible. It should not dictate what services should be available and what they should look like. Instead, it must ensure that competition between traditional parties and new entrants (from both inside and outside the industry) takes place on a level playing field.

- For Distribution System Operators (DSOs), digitalisation means gaining more insight into - and control over - their traditionally 'passive' network. It allows them to drive new levels of operational efficiency and modernise their communication with network customers. It will also enable them to handle more granular data and potentially move to (centralised or decentralised) data hub operations (depending on country models) where DSOs are responsible for metering operations and data exchange. Regulators should recognise the broadening role of DSOs as neutral market facilitators and encourage efficient technological innovation.

- EURELECTRIC believes there is no "one size fits all" data management model in Europe. The best solution must be assessed for each national context. Also, it is crucial for the party or parties responsible for data management to ensure neutrality, non-discrimination, correct and fair information sharing in a cost-efficient and transparent manner while guaranteeing security and privacy.

[1] By "energy players" we mean consumers, regulated entities (DSOs and TSOs) and commercial players (suppliers, ESCOs, aggregators etc.).
[2] By "market players" we mean commercial players such as suppliers, ESCOs, and aggregators.

- Whilst horizontal legislation on data protection exists at EU level – the EU data protection regulation has just been adopted - the energy sector remains a best practice example when it comes to giving customers control over their data. At a time where inter-industry demarcation lines are getting blurry, EURELECTRIC considers that the same regulatory principles should apply to all data directly collected from customers. Thus, transparency and data privacy for customers would be guaranteed and a level playing field for market players assured, even if they come from different sectors.

- DSOs need to collect smart grid data from network customers and adjacent network operators (DSOs and/or TSOs) to plan, operate and manage their networks and the interface with TSOs and other DSOs, without any restriction within the boundaries set by each national regulatory framework.

- Regulators should make sure that information and data is efficiently exchanged between DSOs, TSOs, network customers and market players in all relevant timeframes. Compatible processes, data management frameworks, data formats and communication protocols for data exchange should be set at EU level when applicable and efficient.

Joint DSO/Retail TF Data Management

Contacts:
Sébastien DOLIGÉ, Advisor, Retail Markets & Consumer Issues, sdolige@eurelectric.org
Carolina VEREDA, Advisor, Active System Management & TSO/DSO Interface, cvereda@eurelectric.org

Table of Contents

INTRODUCTION – Going Digital

Technological advancements, telecommunications and data analytics are revolutionising almost all economic sectors. Digitalisation is bringing changes to the way we live, produce, and consume. Synergies between traditionally different sectors are developing (e.g. health and energy). Processes are becoming more efficient and new services and businesses are flourishing.

In the energy sector, digitalisation is transforming the business architecture, redrawing boundaries and redefining relationships between consumers and utilities. A new architecture is vital for the sector to thrive in the digital age. However, as the industry adapts, several other fundamental changes need to be taken into account:

- Power is no longer fully generated from centralised and conventional thermal power plants. It is increasingly produced from variable renewable sources connected at distribution level.
- Distribution system operators (DSOs) and suppliers are no longer the only players serving consumers. With the liberalisation of end-user markets, new players (ESCOs, aggregators, technology companies, etc.) have progressively entered markets, competing to offer services to consumers.
- Many consumers are no longer passive recipients anymore. On the contrary, they are becoming more active and are increasingly interested in value-added services beyond energy.

The digitalisation of the energy system and the advent of smart meters can bring benefits to all energy players. In the short term, consumers will gain more control over their energy use and benefit from additional services. Suppliers will optimise their business, tailor new offers and target their communication. System operators will benefit from new tools to manage their grids more efficiently and integrate an increasing amount of variable renewables in the system. In the long term, interaction between intelligent appliances, smart grids and home platforms – mediated by or on behalf of consumers – will usher in a new era with radically different consumption patterns centred on automation and remote controls.

The road to digitalisation, however, is a winding one.

The roll-out of smart meters at European level is taking place at a slower pace than expected because of varying cost-benefit analysis outcomes in different European countries as well as data privacy and security concerns. Digital appliances and services may not yet be attractive enough for many consumers – not simple enough, too expensive, etc. For businesses, a lack of standardisation and interoperability may slow down the commercialisation of new appliances, and learning to process and convert reams of unstructured data into concrete action takes time.

Markets and innovation will solve some of these issues. However, many will only be mastered if the regulatory framework is fit for purpose. At a time where boundaries between sectors are getting blurred and ever larger sets of data are becoming available, the regulatory framework has to ensure that all data – be it energy related, telecoms-related or from online platforms - is covered by consistent and appropriate regulation. It also needs to make sure that commercial players compete on equal terms to access data and provide services to consumers. Moreover, regulation must ensure that regional monopolies such as DSOs are incentivised to invest in/use smarter and digital solutions and that privacy and security including cybersecurity, are safeguarded.

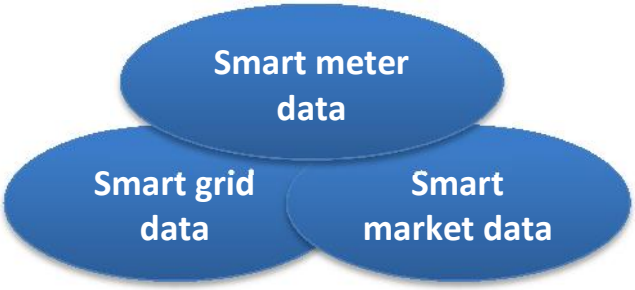
Starting with a mapping of data in the energy sector, this report considers the opportunities and challenges brought about by digitalisation for all energy players. It looks at the regulatory rules which govern data access and makes a number of recommendations. Finally, the report describes some innovative data services by retail suppliers and DSOs.

PART 1 – UNDERSTANDING DATA

1.1 Data Mapping

Understanding the opportunities and challenges at stake with digitalisation and big data is difficult without clarifying the different types of data and how they are treated by regulation.

In this report, we classify data into three main categories[3]. Data is not necessarily collected and/or handled by the same party; neither need it serve the same purpose. As shown by the graph below, some data types can sit in different categories.



- **Smart Meter Data**

Smart meter data covers consumption data (i.e. energy usage as well as historical consumption), production data (if a consumer also owns generation), and master data (i.e. point of delivery identification data4).

Smart meter data is under the control of the consumer and is usually collected at the consumer's premises. It gives more granular information to consumers than traditional metering data and is accessible to the market players who are allowed to process it either to fulfil their regulated obligations (supply, settlement, balancing, etc.) or - with consumer consent - to develop (additional) commercial services.

- **Smart Grid Data**

Smart grid data covers all technical data (e.g. voltage, power quality, frequency etc.) collected by sensors in the network – including smart meters – allowing system operators to plan, operate and manage their networks. Such data - when referring to a specific consumer or to a small group - is generally anonymised.

Smart grid data is needed for network monitoring and management (e.g. to predict or identify congestion) and network planning. It also provides the information needed to manage the interface between DSOs and Transmission System Operators (TSOs). Such data becomes more and more important in a decentralised energy system as it provides the foundations for a flexibility market.

- **Smart Market Data**

Smart market data is the most complex set of data to define. To create innovative services, market players enrich smart meter and smart grid data with data from other sources, e.g. from commercial energy contracts (e.g. price information, first day of supply, payment method etc.), from smart appliances (e.g. devices such as smart plugs, smart thermostats or electric vehicle charging set offered to a consumer, which can provide additional usage and service related data) or from external sources (e.g. meteorological/weather data, demography, social media).

[3] There are many other ways to categorise data (personal vs non-personal data, technical vs commercial data etc.).
[4] This refers to the data used to identify the meter itself and the physical system point where the meter is installed.

Smart meter, smart grid and smart market data all have their specific purpose. However, in the new digitalised energy system, energy players will have to share newly generated information to the extent that such data is needed to ensure system stability and develop new market offerings.

1.2 Data Uses

Data uses in the electricity sector can be divided in two main categories: regulated obligations and new commercial services.

- **Regulated Obligations**

As electricity is considered a universal service, consumers have the right to have their home connected to the local electricity network and be supplied with electricity. This means that any consumer is entitled to be connected to the grid (by the DSO), be supplied and billed (by a supplier) and be provided with high level of security of supply.

To make this possible, DSOs need access to basic meter data from network customers and grid data from adjacent network operators (DSOs and/or TSOs), with the right level of granularity depending on the respective processes (e.g. supply, settlement, balancing etc.), while respecting data security and privacy. The same is true for other players in the energy value chain. For example, although suppliers are not regulated entities, sometimes they also carry out regulated tasks and must still follow a clear set of rules as well as implementing governance structures for customer data with regards to, inter alia, data privacy legislation.

- **New Commercial Services**

As the digitalisation of the energy business progresses, the amount and granularity of available data makes it possible to develop a range of new commercial services beside plain electricity supply. These include, for instance, demand response, energy audits, home management programmes, etc., all of which are expected to generate new revenue avenues for market players. The development of new services is conditional upon consumers giving their consent to access their (smart) meter data on a more granular basis and/or to install additional meters or other devices.[5]

[5] In practice, such demarcation line between regulated obligations and new commercial services is not always clear-cut. For instance, energy efficiency targets have been set in regulation (Energy Efficiency Directive) and designated parties –either a DSO or a supplier – have to either fulfil them or pay penalties. According to EURELECTRIC, the rule should be that market parties should offer the services that can be provided on a commercial basis.

PART 2 – THE OPPORTUNITIES AND CHALLENGES OF DIGITALISATION FOR ENERGY PLAYERS

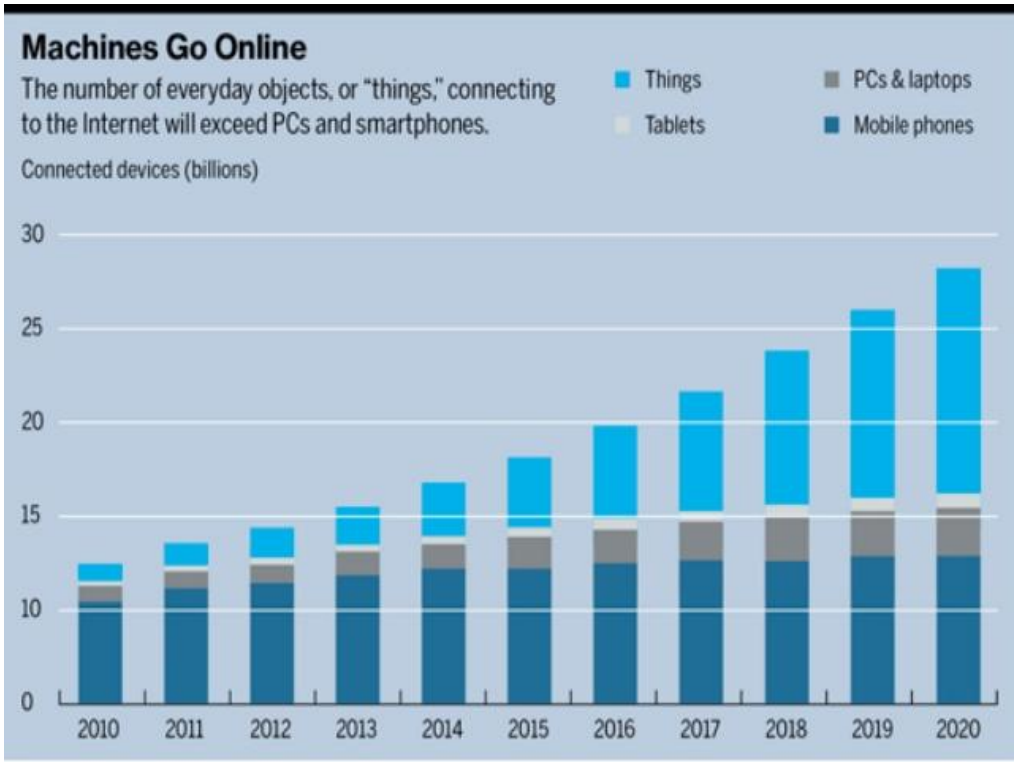
Whilst ICT technologies have long been incorporated into large generation facilities, trading floors, dispatch centres and transmission grids, they are now spreading into distributed energy resources, distribution grids and even appliances in consumers' homes. Digitalisation holds a lot of promise, but it also brings in a number of challenges for all energy market players, including consumers.

2.1 Consumers: Getting More Control and Empowerment

Consumers can buy a variety of electrical appliances with embedded sensors, which can be remotely steered and even be connected to one another. These appliances are generating and exchanging ever larger sets of data - yielding new insights into consumer habits and behaviour: heating/cooling systems and control devices (e.g. thermostats, air conditioning and heat pumps), media devices (e.g. TV, computers, tablets and smartphones), white goods (e.g. washing and drying machines, dishwashers, ovens and refrigerators), and even distributed energy resources (e.g. solar PVs, electric vehicles, batteries/home storage devices).

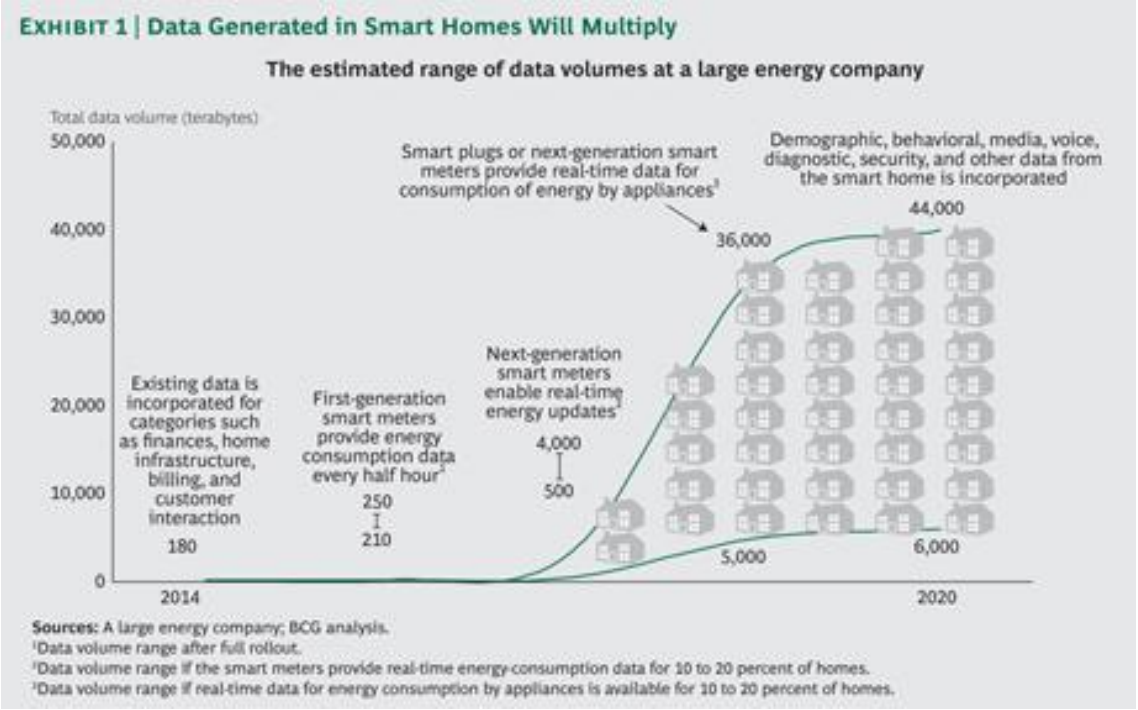
With digitalisation, consumers can have much more control over their energy usage/consumption, adapt it to their own needs and potentially pay for, use and waste less energy. They can benefit from innovative and personalised offers from market players. What's more, they can also smarten up their homes adding a wealth of services (e.g. remote control of appliances, security sensors etc.) at the touch of a button or the swipe of a screen.

Consultancy reports predict billions of objects to be connected by 2020 and the business opportunities generated by the Internet of Things, big data, interoperability and smart homes to be significant.



Source: MIT Technology Review

According to a recent Boston Consulting Group study, by 2020 nearly all objects in a smart home will be capable of generating data that can be monitored either online or through a device.



Source: "Making big data work: retail energy", BCG, July 2014.

Looking at the increasing adoption rate of self-generation and consumption solutions, electric vehicles (EVs), battery-based storage, and the emergence of microgrids, some commentators have started to talk about the "democratisation of energy production". This means that, in the future, households or smart cities could potentially cover part of their energy needs through own production, whereas centralised power stations would primarily be needed for balancing services, back-up needs and to cover industrial demand.

This sweeping change is not limited to energy. Smart homes may well span other areas such as comfort, security and health services. As modern societies witness a steady increase in the size of their elderly population, personal health systems could, for instance, be integrated within the smart home to support home-based e-care. This would allow healthcare services to be extended into the home, empowering the elderly to gain autonomy (e.g. to avoid nursing home placement), participate in modern society, and improve their quality of life.

Yet, some key challenges need to be overcome.

While some connected objects such as smart thermostats may already be popular, a number of studies and surveys outline that services are not yet attractive enough for most consumers – not simple enough, too expensive etc.[6] Also, interoperability (objects/appliances cannot always communicate to one another) and complexity problems (maintenance, reliability, etc.) are slowing down their adoption.

In addition, many of today's benefits such as access to more competitive energy tariffs or price comparison tools hinge on a stable and consistent internet connection. The 'digital divide' currently works to the disadvantage of elderly/more vulnerable and/or less computer-numerate consumers.

[6] See, for instance, Coldwell Banker and CNET Smart Home Survey, August 2015.

Another key issue, particularly in Europe, is linked to data security and privacy. Attitudes to privacy may vary across Member States, but all consumers will only be comfortable with access to - and use of - their data if they are confident that their data is secure and that their privacy is safeguarded. Whilst PCs, tablets or smartphones may generate much more personal data (for instance, through intentional online behaviour and social networks) than smart meters, many citizens choose to share their own information on the Web whereas smart meters are generally 'imposed' on them by industry policy and regulatory choices whilst not always being perceived as useful. Suppliers and DSOs must, therefore, take the time to explain carefully why smart meters are needed, prove - through innovative services - the added-value they represent, how they will benefit consumers and, crucially, how/by whom the data generated by such meters will be used.

2.2 Suppliers: Becoming Full Service Providers

Until recently consumer-supplier interaction has been generally limited to concluding a contract and sometimes solving issues related to billing, payments or supply. With digitalisation, such interaction is set to change significantly.

Suppliers will have access to new data sources and tools to communicate with their customers and better understand their needs, e.g. apps on mobile devices, social media, online portals and chats etc. Instead of monthly bills often based on estimated consumption, suppliers will be able to provide consumers with information on - and prediction of - their energy usage and consumption patterns, even breaking it down into close to real-time information (possibly, appliance by appliance) through extra devices such as smart plugs. As for many household consumers knowing their consumption in energy units (kWh) is neither too meaningful nor actionable, suppliers can offer benchmark comparisons of their consumption profile with similar user profiles, translate consumption data into currency and set alarms when abnormal consumption levels are detected.

Beyond this level of service, which contributes to increasing transparency and consumer trust, more personalised offers and services can be developed by market players. Some are directly related to energy delivery, e.g. remote actions which avoid onsite intervention or services accessible online such as ordering a new meter, switching supplier, requesting a change in connection capacity levels, terminating one's contract and so on. Others may contribute to energy bill reduction, such as optimisation, energy efficiency, home insulation etc. Suppliers can also propose innovative demand response or time of use tariffs which contribute to the efficient operation of the energy system whilst being financially attractive, transparent and guaranteeing a given level of comfort to consumers through remote steering of connected appliances. Finally, suppliers can go beyond energy, offering bundled packages that include home security services, appliance installation/maintenance/insurance, broadband or TV etc. – either self-developed (electricity cables) or jointly operated with technology providers (ICT, telecommunications/media). In summary, suppliers are changing their traditional business models, based on pure delivery of kilowatt-hours, towards becoming full service providers.

However, whilst utilities have considerable experience in collecting and processing meter readings, reporting financial data to regulators, and using data to make investment decisions in generation and networks, dealing with more granular data generated by smart grids and meters will carry a higher level of complexity. Mastering big data analytics will be crucial to make sense of the growing volume of data and additional layers of information about customer demographics and individual/household behaviour.

In addition, energy suppliers are not alone in this race and consumers are not waiting for them. Competition intensifies from all sides. Internet/telecommunications companies and security firms have emerged as some of the first movers, offering home energy monitoring and home automation solutions. Meanwhile, technology start-ups are exploring the market with home energy management products and services that they hope will resonate with consumers. Consumers are becoming market players in their own right, either individually (as prosumers) or collectively (via cooperatives or community schemes). In much the same way as Airbnb's platform disrupted the hospitality industry by directly connecting hosts and

travellers, online platforms might enable neighbouring consumers to buy and sell (some of their) power to each other on a micro market basis[7].

Suppliers will have to proactively find their place in this new ecosystem. They may need to improve operational coordination of activities, invest in data analytics and new IT platforms, recruit data experts and/or develop partnerships with service providers such as Software as a Service (SaaS) companies. Suppliers are ideally placed to act as a linking pin between networks and final consumers by e.g. matching consumption profiles with RES production.

2.3 DSOs: Becoming Active System Managers and Neutral Market Facilitators

Digitalisation brings significant opportunities and challenges to the energy network and to system operators.

For DSOs, digitalisation primarily means gaining more insight into – and control over - their traditionally 'passive' networks. This is particularly relevant at a time when large amounts of variable generation and new loads, such as electric vehicles and storage, are connected to the grid. With more sensors and more automation, DSOs are indeed better equipped to manage complex, intermittent and bidirectional energy flows, keep system stability and reliability of supply and fulfil their security of supply obligations. This bigger role in system operation is also known as Active System Management[8].

As more and more players – e.g. prosumers, aggregators, distributed storage providers etc. - interact with the energy system, the DSO's role of neutral market facilitator needs strengthening. DSOs will have to play a coordinating role between all market participants and facilitate markets and services in a neutral and non-discriminatory manner.

More generally, digitalisation and big data can help DSOs drive new levels of operational efficiency. They can develop predictive and real-time maintenance of transformers and related substations, prevent and remotely correct outages, reduce restoration times, increase asset performance etc.

DSOs can also modernise their communication both internally (making processes more flexible and cross-functional) and externally (with grid users, be them generators, households, SMEs, or public authorities).

Finally, where DSOs are responsible for meter operation and data exchange, digitalisation potentially allows them to handle, manage, and analyse much more granular data, but also to explore new ways of collecting, storing and processing them (data analytics, complex event processing etc.). Moreover, it allows them to move from bilateral exchanges of information with market players to (centralised or decentralised) data hub operation, thus increasing efficiency while facilitating the retail market.

As DSOs are regulated agents, all these developments are heavily dependent on the regulatory framework. Indeed, DSOs will only be able to tap into these opportunities and make the right investments if the regulatory framework incentivises them to do so and ensures revenue recovery. Energy regulators should recognise the broadening role of DSOs as neutral market facilitators and encourage efficient technological innovation. This is not just relevant to DSOs themselves: it is also crucial for all energy players who are dependent on regulated infrastructure to perform their tasks and deliver services, and is crucial for society at large.

[7] If this model were to go ahead, the issue of who pays for the underlying network costs would need to be tackled.
[8] EURELECTRIC's position paper: Active Distribution System Management, 2013.

Regulation should make sure that DSOs are able to invest in the IT architecture that best fits their technical needs. A simple regulatory principle to be observed in this instance is that DSOs must not be financially penalised for using innovative solutions versus traditional reinforcement options as long as investments are efficient. Possible regulatory approaches to this end are higher rates of return, network innovation contests, shorter depreciation rates or direct R&D funding.

Text box: Fit-for-purpose smart meters

Smart meters are not just the endpoint of the network. They are also a key tool to empower consumers. They can allow them to get a clearer understanding of their consumption. They can also make retail market processes (switching, billing, moving, etc.) and network operation more efficient. For instance, as billing needs to be based on validated meter data - that is, meter readings that record a consumer's actual consumption - the higher the data granularity and accuracy, the higher the quality of the bill and the lower the likelihood of billing disputes. Finally, smart meters can bring benefits to consumers in the form of better products (e.g. flexible payment schemes and new tariff models such as time of use prices) and a range of value-added (energy management) services.

Smart meter infrastructure does not need to – or, in many cases, simply cannot – be standardised due to important technical differences across Member States. However, without prejudice to smart meter roll-outs which are already ongoing, it would be important to guarantee that all smart meters across the EU had a minimum agreed common set of functionalities to make sure that they contribute to consumer empowerment and efficient retail markets. Basic common functionalities would include, for example, the possibility of performing remote operations, the capability to provide actual, close to real-time meter readings to consumers, or the possibility to support advanced tariff schemes.

PART 3 – THE RIGHT FRAMEWORK FOR DATA ACCESS AND DATA EXCHANGE

3.1 Smart Meter Data

Information needs across the value chain (DSOs, TSOs, retailers, balancing service providers, aggregators, etc.) vary considerably as a function of the nature of the activities undertaken. Only part of the information gathered from final consumers is relevant for competitive markets to work properly. Common information to be shared would typically revolve around consumption data and master data.

Meter data has traditionally been exchanged between the metering operator (the DSO in most Member States) and market parties in a bilateral way, based on defined standards for common processes such as billing, switching and settlement.

With recent progress in technology, some Member States are now in the process of setting up a centralised data hub. This is a common clearing platform operated by a regulated party (e.g. DSO, TSO or third party). The data processed in the centralised data hub undergoes consistency crosschecking before being distributed to the addressees.

Other Member States prefer to keep this task decentralised, generally in the hands of the DSO. Consistency crosschecking and clearing is then done at local level taking into account network features.

Both approaches have pros and cons. A centralised data hub provides a single point of contact, which is convenient for all market participants - especially for new entrants, as it simplifies data exchange and reduces operational costs. Such a model is becoming increasingly relevant in smarter energy systems, which are characterised by more granular data and greater complexity. However, as a single 'point of failure' it is prone to targeted cyber-attacks. A decentralised data hub typically provides high data quality as DSOs have specific network knowledge and a long-standing experience in data handling. A disadvantage of this approach might be data access fragmentation, which must be managed by market participants.

EURELECTRIC believes that there is no 'one size fits all' model applicable in all European countries. However, common principles must be set at EU level to arrive at a consistent framework. Decisions on the best approach to follow should be taken at national level by National Regulatory Authorities (NRAs). What is most important is that the party (or parties) responsible for data management ensure neutrality, non-discrimination, and correct information sharing in a cost-efficient and transparent manner, while guaranteeing information security and privacy. Some of these general principles are already covered by the latest EU Regulation on data protection. However, we ask that they are made explicit in the particular context of the energy sector as described below.

- **Security and Privacy**
  - Consumers should always remain in control of their consumption data. This means that their consent is required before their data is collected and used for non-regulated purposes (i.e. additional commercial services). Moreover, consumers should always be able to know who uses their data and for what purpose.
  - The right of data correction and deletion must be guaranteed.
  - The storage of aggregated customer data must ensure quality and (cyber) security.

- **Neutrality**
  - The metering data management company should not provide commercial services to final consumers.
  - If consumers decide to retrieve their data from a web platform linked to the (centralised or decentralised) data hub, the platform should not provide data with commercial objectives attached such as customer behaviour tips or similar.

- **Non-discrimination**
  - The metering data management company should not discriminate against any energy player, be it a supplier, an aggregator, a system operator, or an energy services company. Such principle should apply to data access, but also to investment decisions by the data management entity.
  - The metering data management company should provide the same level of service to all its customers, in line with existing legislation and regulations. If a service is available to one player, it should potentially be available to all players – given consumer consent.

- **Transparency**
  - Consumers should be informed by their energy supplier about their rights regarding access to, and use of, their energy data.
  - Consumers should be able to access their consumption data in an easily understandable and standardised format.
  - The metering data management company should make the rationale for its decisions explicit to the NRA that regulates it.
  - The metering data company's costs and long-term investments must be made transparent and auditable by the energy regulator.

- **Cost-efficiency**
  - Regulatory decisions should be fully based on prior cost-benefit analysis in the interest of consumers and society.
  - If the metering data management entity is a regulated company and sells data to market participants, it should not make any extra profits from this activity.

- **High quality**
  - At a time when ever larger sets of (energy) data are becoming available, ensuring high-quality processes is crucial. There are a number of quality components, including data accuracy and timeliness.
  - Setting up a tool for automatic monitoring and data consistency checking at every stage of the process (data extraction, data exchange etc.) might be appropriate.

There is no 'one size fits all' model applicable in all European countries for smart meter data management. However, common principles must be set at EU level: neutrality, non-discrimination, transparency, and cost-efficiency, high quality, security and privacy.

3.2 Smart Market Data

In today's digitalised world, companies have access to behavioural data and customer preferences through commercial contracts, smart appliances and devices, social media etc.

To build consumer trust, companies need to be very transparent about how they use such information. Sometimes, applications or appliances (from GPS systems to smart thermostats) are gathering a wealth of personal data without the consumer being fully aware of which data is collected and how it will be used even if formal consent is given. In line with the reformed EU Data Protection General Framework, we think that privacy principles should be built into systems. We also believe that service providers have a long-term interest in re-sharing information with consumers via simple, pragmatic approaches.

In the energy sector, two relatively recent initiatives from the US and the UK are worth mentioning: Greenbutton (US) and Midata (UK). They both aim at giving consumers full control over their data. Concretely, this means that any personal data generated in their home and linked to their energy supply must be returned to the consumer in a portable format. This may include information on how much energy

the consumer has used in the past year, but also contract end dates, payment methods, total payments made over the last 12 months etc. Such information not only helps consumers better understand how much energy they consume, how much they pay for it and how they can save energy; it also enables them to (re-)share this data with service providers.

At a time when data sources are multiplying and industries have begun to converge, having a consistent, appropriate and high-quality regulatory framework concerning consumption, geolocation, preferences etc. is crucial. Regulatory principles should guarantee transparency, data privacy and a level playing field between all market players from both within and outside the energy sector. More generally, we think there would be merit in enhancing cooperation between regulatory authorities from different sectors to break down silos, enhance competition and innovation and make sure that governance processes for data protection and access are harmonised.

The recently adopted EU Regulation on Data Protection is a step in the right direction. Its timely implementation is key.

The same regulatory principles should apply to all personal data collected from consumers. Transparency and data privacy for the customer would thus be guaranteed and a level playing field for market players assured, even if such players come from other sectors.

3.3 Smart Grid Data

With consumer empowerment (e.g. demand response) and the growth in renewable sources, the need for flexibility will increase in order to prevent and solve grid congestion - both at transmission and distribution level - and to ensure the balancing of production/consumption at national level. More coordination and exchange of smart grid data across system operators and other energy players will be needed to maintain grid stability at minimum cost and to guarantee fair market operations. In many European countries, there is neither a consistent nor a systematic exchange of information across energy market agents on Distributed Generation (DG) and Distributed Energy Resources (DER).

System operators - both TSOs and DSOs - should have the necessary information and data (better frequency/timeliness, right granularity, higher quality) to check and assess e.g. whether certain flexibility bids, when activated, could give rise to grid feasibility issues. By the same token, market players - generators, consumers, prosumers, storage operators, suppliers, Balancing Responsible Parties (BRP), ESCOs and aggregators - need to have access to certain smart grid data via DSOs. For instance, BRPs need to be informed by DSOs/TSOs about substantial impacts on their processes such as the activation of flexibility within their perimeters in order to avoid potentially penalising imbalance situations.

Regulators should ensure that smart grid data exchange between system operators and market players is enhanced in all relevant timeframes (network planning, operational planning and scheduling, day-ahead, intraday etc.). Mutual processes, data management models, data formats and communication protocols for data exchange should be agreed upon at EU level when applicable and efficient. Where this is not possible, Member States should strive for standardisation at national level as a minimum.

TSOs and DSOs should mutually agree on the technical data models, data formats and communication protocols to be used for exchanging information. Aggregated data at the transmission/distribution interface could be used when sufficient, but more detailed data could also be required depending on the functions being performed. For example, TSOs might need information on consumption and generation flows at the physical interface between TSOs and DSOs, with details to be provided about generation types.

In some countries, TSOs might also need detailed information on grid users in order to oversee the grid effects of flexibility offers. Likewise, DSOs might need geographically differentiated information on planned loads, either directly from BRPs or via TSOs, to assess available grid capacity before the market can be cleared, as well as evaluating the need for flexibility to manage any distribution-level congestion.

In 2015, a DSO/TSO platform was launched by the four European DSO associations (CEDEC, EDSO, EURELECTRIC, and GEODE) plus ENTSO-E under the supervision of the European Commission. This platform has studied five use cases to clarify data management and exchange between TSOs and DSOs in the overall context of the energy transition: congestion management, balancing, use of flexibility, real-time control and supervision, and joint network planning. The objective was to study actual illustrative processes from the electricity system and market where the interaction between TSOs and DSOs is of crucial interest. The platform is an appropriate tool to deliver EU-wide principles and solutions for information exchange between system operators and it should be involved in further technical work after the publication of this data management report.

ANNEX – CASE STUDIES[9]

NEW DATA SERVICES BY SUPPLIERS

Most suppliers either offer or are testing devices/software allowing consumers to get close to real-time information about their consumption (provision of smart meter interfaces, in-home displays, and visualisation of consumption and comparisons with peers, energy audits and energy efficiency tips).

Boxx by Electrabel (Belgium)

The Boxx allows consumers to visualise their electricity consumption and cost via a secure web platform using a computer, smart phone or tablet. The application shows total electricity consumption, as well as the consumption of appliances in real time and the historic consumption per hour, day, week, month or year. . It includes a smart thermostat function, which allows programming and modulating the heating, taking into account the weather forecast. It allows consumers to programme single appliances and to switch them on and off in order to benefit from lower prices. Consumers can receive warnings if their actual energy consumption exceeds an established estimate in order to prevent bill surprises.

Eco Manager by EDF Energy (UK)

EcoManager is a wireless appliance controller that helps consumers monitor and control the amount of electricity they use at home. By connecting their appliances to the transmitter plugs included, they can see how much electricity the appliances use, the equivalent CO_2 emissions, and the potential cost of running them – even when on standby. They can then work out how and where they can use less electricity. EcoManager can remotely switch off the connected appliances a consumer is not using, to help save energy and money.

Free My Consumption and Energy Watch by Vattenfall (Finland)

"Free My Consumption" is a free on-line service provided by Vattenfall in Finland allowing consumers to follow their hourly consumption as well as outdoor temperatures, to make comparisons with previous consumption and with similar consumer profiles.

In addition, Energy Watch is a service available at an extra fee, which reports consumers' real-time consumption on a minute-by-minute basis either to a mobile device or via the internet. Energy Watch can break down total consumption into different subgroups, allowing consumers to see which device is using how much energy.

Energy Control by Edison Energia (Italy)

Energy Control is a smart device that allows final consumers to have direct and real time control of their energy consumption (in kWh) and expense (in €) by dialoguing directly with the optical led signal of their smart meters. Thanks to the data collected by this device, consumers can access numerous value-added services:

- Get knowledge of the typical consumption behaviour of similar consumers to understand if consumption habits can be improved
- Receive suggestions to improve energy consumption habits
- Set consumption and expense targets on a daily, weekly and monthly basis. Edison Energia informs consumers via email or sms every time they will exceed the targets
- Decide that for every energy saving target achieved, Edison Energia should donate the equivalent of energy saved to a charity association

[9] The case studies depicted in this section include a mix of already existing services as well as services planned by utilities for future implementation.

E.quilibre by EDF (France)

E.quilibre is a new digital service launched by EDF in 2015. Available within the consumer's private space, it offers a wide range of features for more comfort and savings:

- Consumption dashboard in € and in kWh
- Assessment of consumption for main appliances
- Comparison with similar household profiles
- Off-peak/on-peak analysis (for consumers on night-and-day tariffs)

E.quilibre is free of charge. It offers a powerful platform to deliver an enhanced consumer experience, with new services such as alarms, simulation, energy advice, etc. It will evolve as new data coming from new connected objects (especially the Linky smart meter currently being rolled-out) becomes available. E.quilibre allows EDF to become a player in the future Smart Home, interacting with new connected devices ranging from heating systems to white good appliances.

DIGITALISATION OF NETWORKS AND DSOs

Smart Meter Roll-Out (Finland)

Following the national legislation issued in 2009, DSOs in Finland had to install smart meters with hourly measurement to at least 80% of all metering points on their grids by the end of 2013. At the moment, more than 97% of the 3.3 million connection points in Finland are equipped with a smart meter.

From each meter, hourly-recorded consumption values are transferred to DSO databases, usually during the night after the day of consumption. On the same day, hourly data is sent both to the metering point's supplier and to the relevant consumer via an online portal or electronic message. Accurate hourly data is used in balance settlement and customer billing.

Smart meters in Finland must be equipped with two-way communication capabilities to ensure the possibility of controlling the loads connected to the meter. Two-way communication enables many other useful functions. Most metering points can be disconnected and reconnected remotely and read any time from the DSO's control room or customer service department. DSOs also receive power quality data, which makes the operation of the network more efficient. Smart meters can help detect outages immediately. Information about outages is also sent to the relevant connected customer by SMS. In addition to consumption measurement, the same smart meter is capable of recording production that is fed to the network from the metering point. The hourly time series of consumption and production are separated and can be sent to different market players. Many suppliers in Finland buy surplus electricity from small-scale producers/prosumers.

An example of online reporting service for consumers

There are several service providers in Finland that use hourly data to provide energy efficiency services or procurement of electricity for big consumers with several metering points. When a consumer requests the hourly data, it will be sent in a standardised electronic format to a 3rd party appointed by the consumer. The DSOs will not charge the consumer for this service. The consumer needs to contact the service provider and agree on the terms of service and set up a power of attorney. The service provider will then contact the DSO relevant to the metering point to agree on data exchange party ID and other receiver details. When distributing data to third parties, the DSO must ensure that consumer authorisation is granted. A valid power of attorney is needed to ensure privacy.

Towards a Digital DSO, ERDF (France)

Smart Meters & Smart Grids for Energy Transition

With the Linky smart meter and smart grids, ERDF will address the challenges of energy transition (integration of intermittent renewable energy capacities connected to the distribution grid, EV charging stations and demand response). ERDF is rolling out 35 million smart meters (2015 – 2020) and is investing in smart grid demonstrators in France and in Europe (18 demonstrators) to prepare smart grid industrialisation.

Digital Program for Energy Transition and Consumers' Empowerment

In 2014, ERDF launched a company-wide digital program to reach best digital standards with four main actions:

- Digital relationships with consumers and local authorities: Reaching the best level of digital standards for all consumers - Building a relationship with digital standards with local authorities and market participants and adapt it over time
- Digital network management: Developing predictive maintenance on transformers and related MV substation - Making data the second most important asset of future - Establishing a predictive and real time management planning from source stations to low voltage (LV)
- Culture & Collaboration: Making ways of working more flexible and cross-functional, leveraging enterprise social network to strengthened collaboration
- Digital innovation and Mobile experience: Offering an optimal mobile experience aligned with external best practices (devices and usages) giving rise to an environment that is genuinely open to innovation
- Data operation: Developing a big data capability allowing to manage, analyse, enrich and publish metering data

Data for Consumers

ERDF is promoting an open data approach and developing services for local authorities and private consumers. As a regulated entity, ERDF is well positioned to guarantee data protection (personal, industrial and commercial data) and neutral market facilitation.

- ERDF is committed to an open data process. The company publishes online raw data in partnership with Etalab and the French government on the website data.gouv.fr
- ERDF will make daily consumption data available to consumers. An easy and user-friendly web portal has been created where consumers can consult their data (time intervals of 30 minutes, 1 hour, 24 hours). With consumers' consent, data will be communicated to third parties (retailers, aggregators) which propose commercial services

DATA MANAGEMENT MODELS

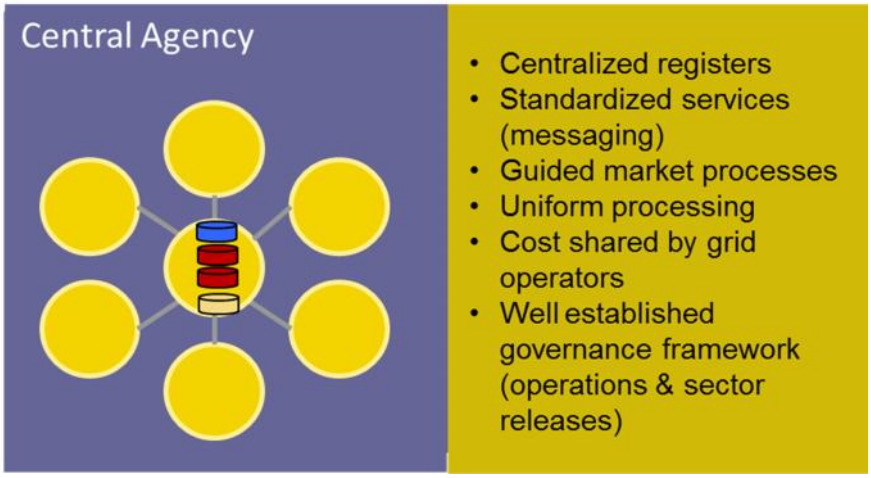
Meter data has traditionally been exchanged between the metering operator (the DSO in most Member States) and market parties in a bilateral way, based on defined standards for common processes such as billing, switching and settlement. With recent progress in technology, some Member States are now in the process of setting up a centralised data hub. This is a common clearing platform operated by a regulated party (e.g. DSO, TSO or third party). The data processed in the centralised data hub undergoes consistency crosschecking before being distributed to the addressees. Other Member States prefer to keep this task decentralised, generally in the hands of the DSO. Consistency crosschecking and clearing is then done at local level taking into account network features. EURELECTRIC believes that there is no 'one size fits all' model applicable in all European countries. However, common principles must be set at EU level to arrive at a consistent framework. Decisions on the best approach to follow should be taken at national level by National Regulatory Authorities (NRAs).

The Central Data Hub Agency "EDSN" (The Netherlands)

The Dutch DSOs and TSO jointly set up in 2008 a central data hub agency called EDSN, through which they facilitate the Dutch Energy market with a number of market facilitating services. Via the central hub's systems and data, the following processes are supported:

- Customer processes (supplier switching, moving in/out)
- Delivering of metering data (historical and smart meter data) to market parties, provided consumer consent is obtained
- Settlement of grid charges from suppliers to DSOs
- Allocation and reconciliation services, based on smart meter data, are expected to be added to the market facilitation service portfolio in 2017/2018

Around the central hub agency, a well-balanced governance structure between market parties and DSOs has been established, making a distinction between systems and services. EDSN is positioned as a shared service centre for delivering market facilitation services to all market parties on behalf of the system operators and is responsible for operating the central data hub systems. The responsibility for defining the right market facilitating services, supporting processes and implementing updates is allocated to an association (NEDU) in which all market players (suppliers, BRPs DSOs, TSOs, metering operators) participate.

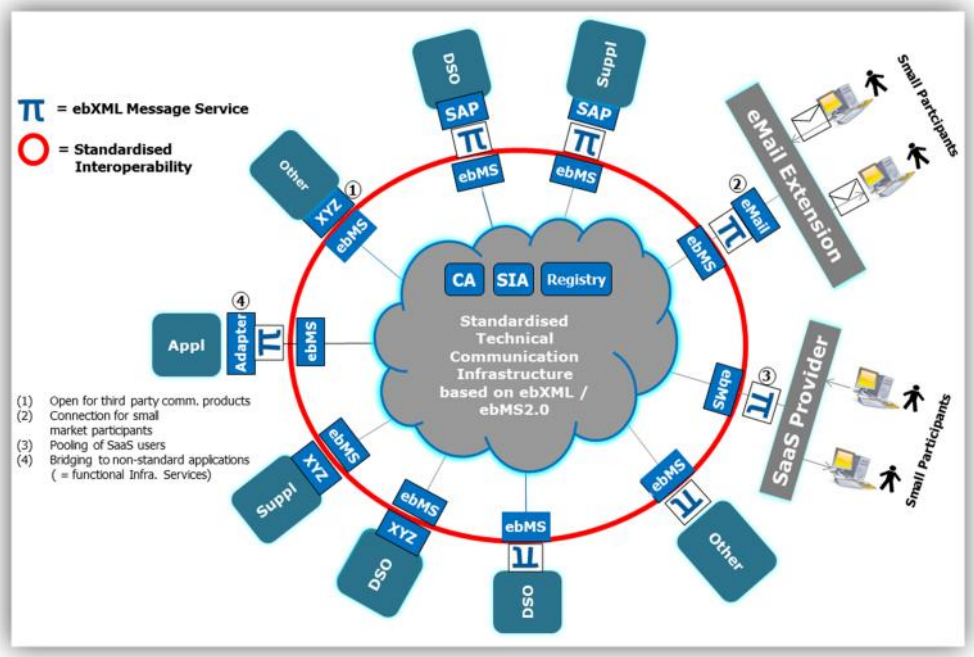


Service Hub. Standardised Market Communication with EDA (Austria)

Enterprises of the Austrian energy industry exchange data with one another for many reasons: provisions of metering data, data for the switching of suppliers, electronic invoices, etc. To accomplish this safely, both power and gas suppliers along with grid operators need to transfer electronic data in a secure, reliable and standardised way. They need to provide a common data exchange infrastructure for all market players.

The Austrian Association of Grid Operators "Österreichs Energie" initiated the EDA Project (Energy Data Exchange Austria) to provide a common data exchange infrastructure.

The EDA consortium selected a message-based communication tool (see the scheme below) as the main workhorse for sector-wide integration processes. The tool combines locally installed communication bridgeheads with central services for issuing electronic certificates, message routing and technical support services. All of this provides an easy access, unified communication layer, which allows small and large organisations to participate in. EDA has been running since 2012 without any issue.



The core of EDA is a shared, unified infrastructure supporting secure end-to-end communication thanks to strong and approved encryption as well as authentication, standardisation, flexibility to minimise connection efforts for new market participants, efficiency, performance, scalability and openness.

EDA allows both small and large organisations to exchange data in a uniform way. DSOs as data managers and single information contact points are two functions that EDA can enable.

In Austria, EDA is in use for data exchange by electricity, as well as gas utilities. The overall costs for Austria are about 400.000 € per year. The costs include the support for each market participant. Each participant can use the common interface or decide for a custom implementation. Each additional participant reduces the individual costs of all others.

Österreichs Energie owns the EDA code and thus is not dependent on a certain IT service provider for maintenance and further development. In Austria, there are around 6.0 Mln metering points for electricity and around 1.5 Mio metering points for gas.

EDA was designed to be a non-discriminatory and standardized data exchange format.

- The fact that data hubs are at the premises of the single market players guarantees that the exchanged data are always up-to-date. The decentralized data hubs reduce the risk of cyber-attacks.

- Data exchange takes only a few seconds.
- Data exchange happens always directly between 2 parties (e.g. DSO x with supplier y).
- Data are encrypted (inside an envelope) and can only be decrypted by the receiver.
- When exchanging data via EDA, the whole envelope is encrypted again.
- The data structure inside the envelope can be extended and adopted to future needs without any necessity to change or extend EDA itself.
- Authorization by the customer for data exchange (e.g. customer switching or smart meter data) is also shared via EDA (data privacy).

Decentralised DSO Data Hub. EDIFACT framework (Germany)

Further to the implementation of the Third Energy Package, the German Federal Utility Regulator (BNetzA) designed the main market processes and rules for electricity and gas. These are based on the "EDIFACT" standard messaging format and are used for managing supplier switching, settlement/balancing and accounting, as well as following market liberalisation, metering.

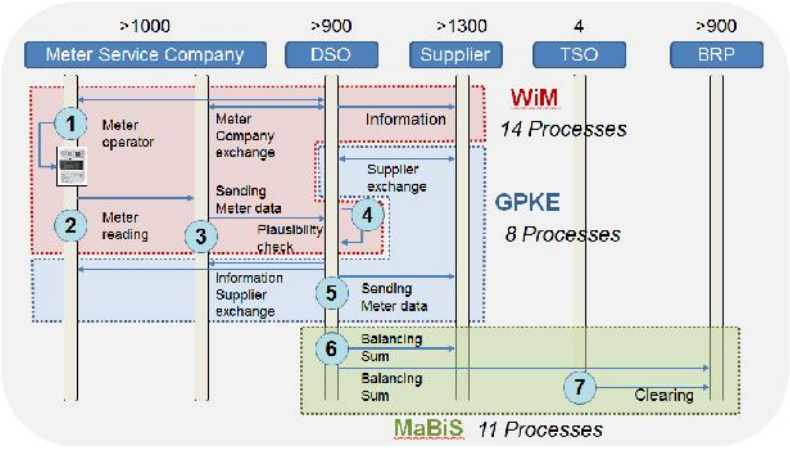
Recently BNetzA also introduced a process to handle feed-in-points and their allocation to direct market players that resell the energy produced by distributed renewable energy sources on the market. Based on the general decisions made by the regulator, the member companies of Germany's energy industry association (BDEW) defined and standardised relevant messages and their formats, followed by a public consultation supervised by BNetzA.

Even though EDIFACT is the regulated and standardised communication tool for network operators (TSOs and DSOs), all other market players (i.e. suppliers, metering point operators, balance responsible parties and imbalance settlement responsible parties) use it as well – at least when communicating with a network operator. It is a decentralised approach using a common communication standard. For example, each network operator is responsible for collecting (in its market role as metering point operator), validating and distributing the relevant data to eligible market partners.

Today, all market players in Germany, approximately 3,000 regulated and unregulated companies, use EDIFACT with good results. For example, Westnetz (an RWE DSO) and NetzeBW (an EnBW DSO) who together serve approximately 12 million inhabitants, handle a total of more than 500 million EDIFACT messages a year – this being only a fraction of the yearly messages used in Germany as a whole. Processes, messages and formats are adjusted continuously due to changes in laws, acts and market rules using the process described above.

The figure below gives an overview of how the system works about serving final consumers in the electricity market.

Decentralized German data management in the electricity market
Overview of German processes and market roles



TSO-driven Centralised Data Hub (Nordics)

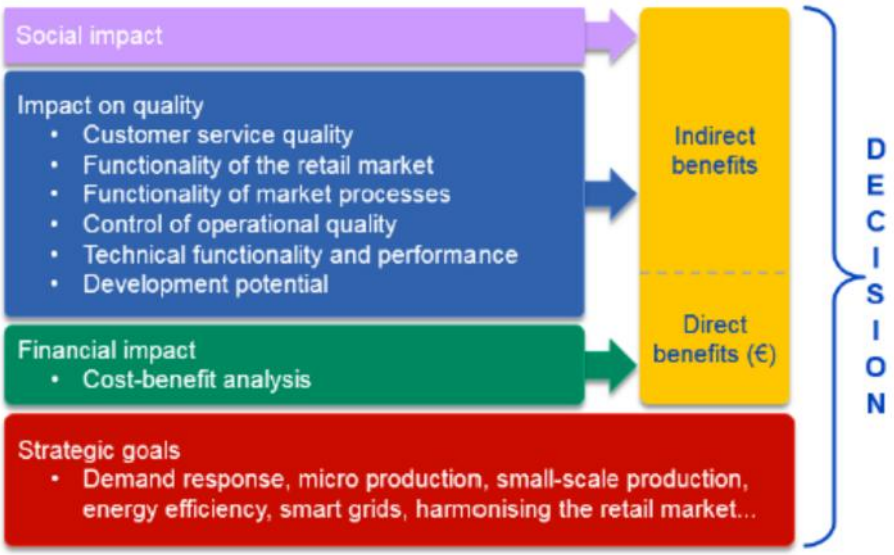
In all four continental Nordic countries (Finland, Sweden, Norway and Denmark), TSOs have been given the task to develop and operate a centralised data hub. In Denmark, the data hub has been in operation since 2013; in Norway it will go live in 2017 and in Finland 2019. In Sweden, the development is also under way, but the go-live date is not decided yet.

The data hub model in the Nordics consists of both data exchange through a single point and a central database for market data. However, there are differences in functionalities and details of the hub as well as in the market model and processes. One goal for setting up national data hubs has been to facilitate the harmonization of retail markets in the Nordics. The wholesale market is already in large integrated, but the retail markets are still national. The integration is more difficult due to the differences of processes and data exchange procedures. Data hubs are seen as buffers between national markets to enable easier harmonization in the future. However, the decisions of implementing a data hub are national and have been made from the grounds of each country itself.

In Finland, the industry association has voluntarily fulfilled the task of developing and standardising data exchange procedures of the electricity retail market. Since 2013, the new Electricity Market Act has mandated the TSO to be responsible for this task.

In 2014, Fingrid (TSO) carried out a study about future solutions for data exchange in which many stakeholders were involved. The report recommended the implementation of a data hub with a central database and it was addressed to the Ministry of Employment and the Economy. TSO was seen as a neutral choice to develop and operate the data hub in Finland among other entities.

A central database has been retained in the Nordic region because it improves the quality and speed of market processes as well as reducing back office costs for all market players. In practice, information about an action on the market (e.g. supplier switch) is available for the relevant parties in real time. All market parties are connected only to the central system where the master data of metering points, consumers, their contracts and measurement data is stored and maintained. Bilateral data exchange between parties is not allowed. Third party service development, for both end consumers and market parties, will be enabled through standardized interfaces and authorisation functionalities. Data hub also enables central imbalance settlement for the DSOs, statutory reporting of consumption data, monitoring operational quality of data exchange and testing and certification service for market parties. Generally, the idea is to move from a decentralised market and support functions to centralized functions. This reduces overlap and enables market parties to focus on their individual services, which, on the other hand, enhances operational efficiency. Furthermore, the centralised solution shall provide all parties with equal and simultaneous access to the information.



- **Integrated Information System (Italy)**

The structure of metering data management in Italy is evolving according to Legislative Decree 102/2014 (transposing the European Energy Efficiency Directive into national legislation) as follows:

- Metering data will still be collected by the DSO.
- Operational data will still flow directly between DSOs and downstream market players.
- There will be a third party, the Integrated Information System (SII), managed by the Single Buyer (Acquirente Unico (AU) which will make historical consumption data available to market players, the NRA, and consumers or delegated parties via a centralised management platform.
- The RCU (Official Centralised Register) will be updated on the basis of the information received by DSOs. These data can be queried by third parties.

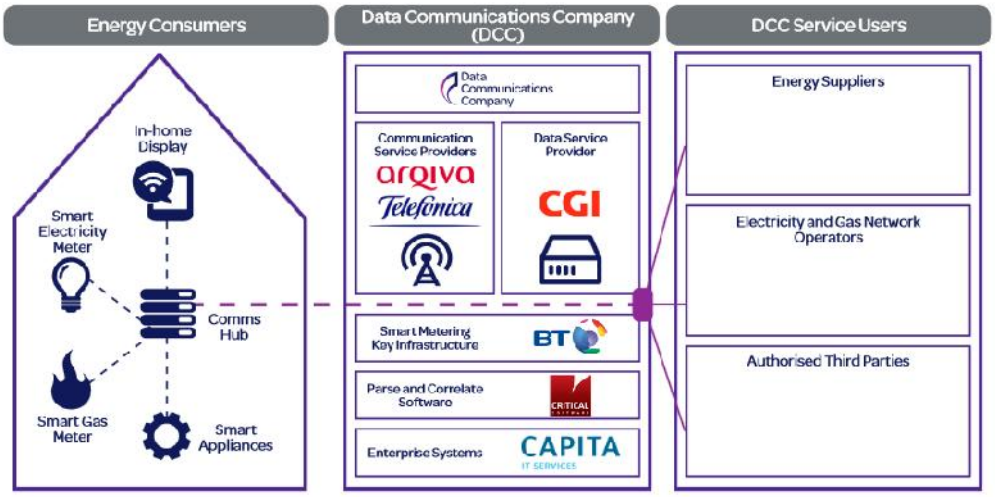
The model preserves direct communication between market parties and DSOs, with the standardisation of the communication flows as defined by the SII and the evolution of commercial processes (i.e. switching will also be managed through the central interface of the SII), while leaving current commercial responsibilities unchanged.

The AU will be responsible for monitoring all market transactions involving DSOs from a central system perspective while ensuring that NRA standards are met and that potential anti-competitive behaviour is kept to a minimum. The implementation of this model also represents a consistent improvement in terms of reduction of market players' operational costs for data exchange, in particular in a highly fragmented scenario, with numerous DSOs.

- **Smart Data and Communications Company (GB)**

The Government department responsible for energy (the Department of Energy and Climate Change) led the regulatory and policy design activities to ensure that consumer protection is embedded within the legislative framework in Great Britain. This means that there is an opt-in framework for half-hourly data collection by suppliers that requires consumer consent. It also means that consumers can choose to make their data available to third party providers such as switching sites or energy service providers. Data access can be provided locally using a Consumer Access Device or via the Smart Data Communications Company. In both circumstances, the third party must have the consumers consent to access their data.

In Great Britain, the smart metering roll out is a supplier led model utilising central data and communications technology provided by a regulated entity the Smart Data Communications Company. The diagram below provides a visual representation of the smart metering eco system being rolled out within Great Britain.



The Smart Energy Code (SEC), a new dual fuel multi party industry contract has been developed. The SEC articulates the services provided by Smart DCC to DCC Service Users, this includes suppliers, network operators and authorised third parties. Authorised third parties can include switching sites and energy service providers. Consumers can choose to make their consumption and tariff information available to these providers either via a Consumer Access Device or via the Smart DCC.

Energy suppliers rolling out smart meters will offer all domestic consumers an In Home Display, which provides near real time access to usage data, as well as access to historic data. A number of suppliers offer online energy platforms which provide consumers with daily, weekly and monthly summaries of electricity and gas consumption and cost.

CONSUMER ACCESS TO OWN DATA / VOLUNTARY INDUSTRY INITIATIVES

Midata (GB)

Midata is a multi-stakeholder initiative, which brings together the UK government, consumer groups and businesses from the banking, telecoms and energy sectors. It has three main objectives: (i) get more private sector businesses to release personal data to consumers electronically; (ii) make sure consumers can access their own data securely in a way that is portable and safe; and (iii) encourage businesses to develop innovative services and applications that will interpret and use the data for consumers. The ultimate goal is to give people greater access to electronic records of their past buying and spending habits to help them make better choices.

The major 6 energy suppliers supported the Government's Midata vision when it was published in November 2011, and has since been working with other suppliers, regulators, government and price comparison sites to agree specifications on data downloads and bring about implementation of the proposals. All six main GB electricity suppliers plus First Utility are now in the process of making data available electronically as a download.

Midata offers an opportunity to learn about the new data environment in advance of smart meters being fully rolled out. Finally, Midata investigated scope and options for making data available electronically through QR codes.

Green Button (US)[10]

Green Button is a voluntary industry standard – with no regulatory mandate - developed to "liberate" data. It is an effort that responds to a White House call-to-action in mid-2011 to provide electricity consumers with easy access to their energy usage data in a consumer-friendly and computer-friendly way.

Green Button is adopted by the North American Energy Standards Board. More than 150 utilities and service providers have committed to providing more than 60 million U.S. households (including altogether 100 million people) access to their own Green Button energy data[11]. Green Button is designed to help consumers make the most of their energy usage information. It connects three types of data: downloaded usage data, data stored on the utility website and smart meter interval data or monthly usage data. Consumers log in, download the data and can upload the information to an app to receive further information.

How does Green Button work in practice? Firstly, the consumer has to login on the utility's website and download the Green Button file. Afterwards, they log on to the supplier's website and upload the Green Button file. The supplier will analyse the data based on consumer usage and other inputs and will display results on its website. Results can be updated automatically, either weekly or monthly.

This setup also allows consumers to authorise a third-party service provider to receive direct access to their Green Button Data. Thus, there is the possibility for aggregators or other ESCOs to be involved.

Consumers can save energy through better understanding of their consumption, which they can also use to modify their behaviour and/or inform their investments in energy efficiency at home (appliances, insulation etc.). Green Button allows consumers to compare their energy use data in a simple, accurate and meaningful way. Consumers can also benefit financially as they can compare their existing tariff with alternative offers.

Smart Info by Enel Distribuzione (Italy)

Smart Info is a smart meter interface device allowing customers to have their electronic meter information at hand, helping them to optimise their energy consumption in a more efficient and sustainable fashion. Smart Info provides easy access to smart meters' data that can be visualised on customers' own devices such as a display, a computer, or a smartphone or used to programme domestic appliances so that they are switched on/off at the most convenient times. Currently, Smart Info is being tested in some local areas in Italy. It involves a few thousand families who received for free an experimental kit (Smart Info itself, a dedicated display, and software for their computers and smartphones).

[10] An EU Green-button initiative has now been launched by the European Commission

[11] https://www.whitehouse.gov/blog/2015/07/22/green-button-initiative-makes-headway-electric-industry-and-consumers

DATA EXCHANGE BETWEEN SYSTEM OPERATORS AND MARKET PLAYERS

DSO-TSO data exchange (Portugal)

In Portugal, the DSO (EDP Distribuição) and the TSO (REN) have regular and systematic interactions to exchange information for five main purposes, as shown in the table below.

Purpose of data exchange	Example of data exchanged	Frequency
Network planning coordination	Distribution and transmission network expansion plans	Twice a year
Operational coordination	Maintenance schedules, contingency plans, network configuration, protection settings	A few times a year
Dispatch coordination	Currents, voltages, active/reactive power and circuit-breaker state at interconnection points	Real-time (through ICCP*)
Settlement of transmission network use charges	Active and reactive energy delivered at interconnection points, reactive limit deviations	Monthly
Wholesale market settlement	Energy consumption of each retailer's portfolio with 15-min resolution; allocation of network losses	Daily

**** ICCP – Inter-Control Centre Communications Protocol***

In Portugal, the amount of RES capacity has grown rapidly over the last 15 years, mostly driven by wind generation. Today, installed distributed generation (DG) capacity represents more than 95% of peak demand and in 2014 over 60% of all electricity used in the country was supplied by renewable sources (70% of which originated within the distribution network). Such rapid growth in DG has increased the need for closer DSO-TSO interaction.
Generally, the TSO is concerned with the impact of DG on global system balance (e.g. frequency), while the DSO is mostly concerned with its local impact (e.g. voltage).

Meanwhile, recent regulatory changes in Portugal introduced the possibility of RES curtailment under specific circumstances. With the new regulations, both the DSO and the TSO have the possibility of issuing curtailment orders to the same RES facilities, which creates an obvious need for coordination.

For that purpose, REN and EDP Distribuição are setting up an integrated system for real-time data exchange (based on ICCP) that reports online information about each RES facility and enables curtailment orders issued by both parties, identifying the reason for curtailment and the amount of power being curtailed. As DG continues to grow in Portugal, for example with PV generation and self-generation/consumption, coordination needs between EDP Distribuição and REN will increase even further.

Another domain of TSO-DSO interaction that is undergoing important changes is the wholesale market settlement. In Portugal, the DSO is responsible for determining the aggregated load curves of suppliers and providing this data to the TSO for wholesale market settlement. These load curves must have a 15-minute resolution to support the market operation. The fact that the majority of domestic low-voltage customers do not have smart meters installed yet has two important implications: (i) statistical load profiles must be used to compute 15-minute load curves; and (ii) the balance for any given day must be updated up to 9 months later, when the relevant meter readings will become available. The deployment of smart meters for all consumers will bring about a significant improvement in the accuracy and timeliness of the aggregated load curve information exchanged between DSOs and TSOs, thus contributing to improve the overall efficiency of the system.

Balance Settlement Based on Hourly Measured Data (Finland)

In Finland, balance settlement is based on accurate metered data. More than 97% of the metering points and close to 100% of the distributed energy is metered hourly – both consumption and production – and this data is used in the settlement process. Load profiling is used only for a small part of the smallest points of consumption and it is decreasing. The same balance settlement rules are applied for every market party.

Benefits

With accurate data, the imbalances of each supplier and BRP can be calculated precisely within a shorter time. The final balances are settled and invoiced monthly. Accurate settlement contributes equal treatment of each market party. There is clear improvement in the quality and equality of settlement, compared to the past load profile based balance settlement which is only an estimate of the distribution of energy between market parties. Hence, consumers and market parties are billed based on actual consumption, not estimation.

2-way metering together with hourly settlement enables prosumers to sell surplus energy in a market-based manner to any supplier (buyer) they choose. Thus, energy taken from or fed into the network is always put hour-by-hour in the balance of the right player according to the matching principle. With hourly data from each consumer, the suppliers are able to forecast behaviour and consumption of their customers more precisely. This helps the suppliers to optimize their procurement and minimize imbalances. In addition, the consumers can follow their consumption from online-portal which increases awareness of consumption and helps to save energy.

End consumers are able to choose hourly priced dynamic products based directly on the wholesale market prices. In practice, all consumers are able to participate in demand response by shifting their consumption from peak-hours to the cheapest hours of the day. There are home automation products and services available that automatically conduct needed control functions, such as switching on electric heating during the cheapest hours. Because of hourly balance settlement this kind of control actions are calculated only in the right balance. There is no need for third party service providers to enable DR for each consumer.
Network losses and deficits can be measured accurately and DSOs can purchase the energy from the market. Also, meter readings exactly at the moment of supplier switch or consumer move prevents the energy around the contractual change of the consumer to be put in balance of wrong supplier.

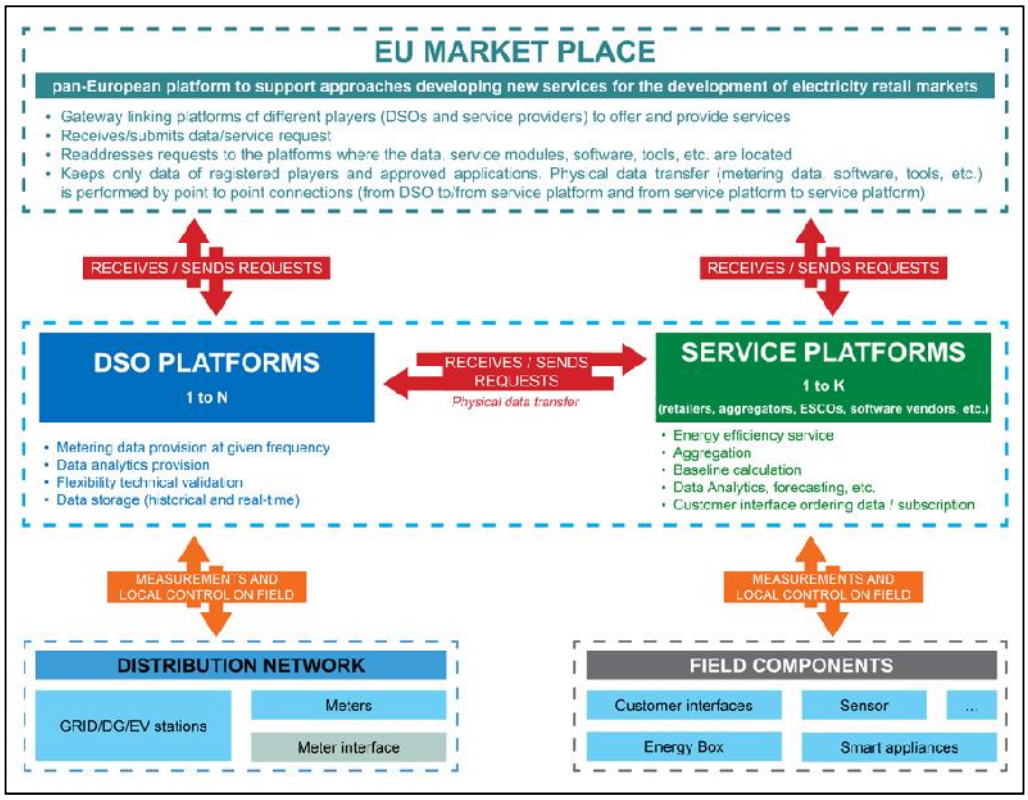
Further development of the model

In November 2016, the harmonized Nordic Balance Settlement model (NBS) will be put into operation in Finland, Sweden and Norway. There will be only one SR and the same settlement rules in each country. The schedule and invoicing of balance settlement will shorten from monthly to weekly. Implementation of centralized data hub in 2019 will shift the aggregation of data from each metering from DSOs to the data hub.

Flexiciency Project (EU)

4 major European DSOs (Enel, ERDF, Endesa and Vattenfall) with smart metering infrastructure in place – together with electricity suppliers, aggregators, software providers, a system integrator, research organisations and one large consumer - are undertaking 5 large-scale demonstrations. The aim is to show that the deployment of efficient novel services in the electricity retail markets (ranging from advanced monitoring to local energy control and flexibility services) can be accelerated thanks to an open European market place based on standardised interactions among electricity stakeholders, opening up the energy market also to new players at EU level.

A virtual ICT environment, the EU market place will be developed in the project in order to catalyse the interactions between relevant stakeholders in an open and standardized way. It is a gateway linking platforms of different players (DSOs and service providers) to offer and provide services.



DSO Platforms

Relevant meter data will be made available by DSOs in a non-discriminatory way close to real time to all the interested players, under consumer consent, through advanced interoperable platforms that will be enhanced in the project and built on open standards.

In terms of innovation, any new DSO platform must feature new capabilities beside those currently available, and in particular: metering data close to real time (consumption and generation data), data storage, data analytics and forecasting and the technical validation of those services which have an impact on networks.

In most EU countries, smart meters have been deployed. This makes it possible for DSOs to provide similar data for any subsequent smart processing as well as helping retailers offer new energy efficiency services.

Service Platforms

Service platforms (from different types of market players such as TSOs, DSOs, suppliers, ESCOs, aggregators or other companies able to offer data analytics services) are interested in having access to real time metering data, provided that they are accessible in a standardised way through open APIs (Application Program Interfaces), and with interfaces compatible with the variety of IT systems which are in use today.

Platforms made up of retail companies operating in different regional contexts will be involved in Flexiciency, both with and without smart metering infrastructure, with and without DSOs on board. Platforms led by other service providers, such as software vendors, will also be in the scope of this project to demonstrate the concept of integrated services markets.

Market Place

The market place allows the delivery of services and exchange of data, tools, methodologies, etc., in a standardised way across Europe for the accelerated deployment of innovative energy services for all stakeholders of the retail markets, in particular:

- Service providers will be able to request metering data from the different DSOs depending on the targeted control zone at a given frequency
- Service providers will be able to exchange services, tools, methodologies (for example an ESCO using a specific tool from a software vendor)
- Asset (data) owners will be able to make available data (other than metering data) to allow providers to build new services
- All data flows, for instance metering data (data provided by DSOs), will be implemented by peer to peer communications, i.e. the market place will be a contact point for business deals between stakeholders of the electricity retail markets

Field Components

Several field components will be installed for both measurement and control at field level, acting as local interfaces and controllers at consumer premises to deliver services. The adoption of interoperable solutions will be addressed in the project leveraging on existing standards and open communication protocols.

EURELECTRIC pursues in all its activities the application of the following sustainable development values:

Economic Development

- Growth, added-value, efficiency

Environmental Leadership

- Commitment, innovation, pro-activeness

Social Responsibility

- Transparency, ethics, accountability

Union of the Electricity Industry - EURELECTRIC aisbl
Boulevard de l'Impératrice, 66 - bte 2
B - 1000 Brussels • Belgium
Tel: + 32 2 515 10 00 • Fax: + 32 2 515 10 10
VAT: BE 0462 679 112 • www.eurelectric.org
EU Transparency Register number: 4271427696-87